Swift Burst Alert Telescope (BAT)
Image Processor (IP) /
Block Command and Data Handler(BCDH)
Interface Test Procedure
Rev -

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REVISION PAGE

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Introduction

The Image Processor and the Block Command and Data Handler are subsystems on the Swift Burst Alert Telescope. The Image Processor (IP) is a data system required to collect, process, and analyze data that will be transmitted from the BAT instrument front end electronics. The BCDH interfaces to the BAT detector modules to receive Gamma Ray Burst event data.

Purpose

The purpose of this document is to outline the procedure that documents the process required to verify the SpaceWire interface between the Image Processor and the Block Command and Data Handler prior to the release of the ASIC code for both subsystems.

Document Scope

This document outlines the procedure for verification of the IP-BCDH SpaceWire interface. Verification of data shall be performed by the Test Engineers and the BCDH lead engineer per the Swift Burst Alert Telescope Block Command & Data Handler Software Interface Control Document(410.4ICD-0002a).

1.3 Required Hardware

The following components are required for this interface test.

A. Flight Rad6000 Processor card
B. ETU Bulk Memory/1553 card
C. Breadboard MIC card
D. Demo2 or ETU BCDH
E. BCDH Simulator(if available)
F. BVR Simulator
G. Power Supplies
H. 15-ft MIC-to-BCDH interface cable
I. MIC Loopback cables

Applicable Documents

Standards

GPG-8730.1   Calibration and Metrology

NASA-STD-8739.7   Electrostatic Discharge Control

Procedures

410.4-PROC-0064   Swift Burst Alert Telescope MIC GSE and BCDH ETU to IP Multi- Channel Interface Card Safe-to-Mate

2.3   Documents

410.4-ICD-0002a   Swift Burst Alert Telescope Block Command & Data Handler Software Interface Control Document

BAT DM Controller Specification Draft 5 7-31-01

Block Command and Data Handler Hardware Interface Control Document, Rev F, 7/16/01

Swift Burst Alert Telescope (BAT) Image Processor (IP)Interface Control Document

410.4-PLAN-0006 Burst Alert Telescope Parts Control Plan

410-4-PG-8730.3.3   Swift Quality Management Plan

410-SPEC-002   Swift Mission Assurance Requirements Document,

Quality Provisions

Stated below are the Quality Provisions for Quality Assurance (QA) as they relate to this interface test.

Test shall be in accordance with the Swift Mission Assurance Requirements Document, GSFC-SWIFT-410-SPEC-002 and the Swift Quality Management Plan, 410-4-PG-8730.3.3 and the 410.4-PLAN-0006 Burst Alert Telescope Parts Control Plan.

Test Conduct

The performance of operations specified in this procedure requires the presence of the Quality Assurance representative, unless waived by the QA representative. QA shall be notified 24 hours prior to the start of the test. QA shall be notified at test completion to review data recorded in this procedure. As applicable, the Test Engineer shall certify the GSE required for the test is complete by verifying that it is in calibration. Upon completion of the test, the resultant test data shall be attached to this test procedure.

3.2 Failure Criteria

The inability of the device under test (BCDH or IP) to perform its required functions, as specified, during test operation shall be considered a failure.

3.3 Failure Reports

Malfunction or failure reporting shall be in accordance with the Swift Quality Management Plan.
All anomalies resulting from this test shall be documented in the Image Processor log book. Problems relating to the SpaceWire interface shall be documented on the Problem Record form.

3.4 Test Conditions

a.   Temperature: 18.3 degrees C to 27.8 degrees C (65 degrees F to 82 degrees F)
b.   Relative Humidity 30% to 70%
c.   ESD Protection: Equal to Requirements defined in GSFC ESD NASA-STD-8739.7.

3.5 Procedural Changes

Deviations from this procedure during test shall be red lined on the as run procedure by the cognizant Test Engineer , the PDL or the QA representative.

4 Requirements

4.1 General Requirements

The following general requirements shall be followed during the conduct of this procedure.

4.1.1 Precautions/Operating Instructions

a) The requirements of proper handling of ESD sensitive hardware shall be followed. Personnel handling the boards shall be ESD certified.
b) Breast pockets shall be emptied and badges tucked in, prior to working over the circuit cards.

4.1.2 Test Records

All data taken during this test shall be recorded in this procedure. Print outs shall be attached to this procedure. Testing using any flight cards shall be recorded on the WOA for that component; this test procedure shall also be referenced on the WOA.

4.2 Test Equipment

Test equipment used for this test shall be recorded in Table 4.3-1

TABLE 4.3-1 TEST EQUIPMENT LIST			
NOMENCLATURE	MANUFACTURER	NEMS(NASA ID)	Cal. Due Date

4.3.2 Perform a continuity check on any Breakout box(BOB) used during this procedure._____

5. Test Sequence
5.1 Initialization

- Perform the Swift Burst Alert Telescope MIC GSE and BCDH ETU to IP Multi- Channel   Interface Card Safe-to-Mate procedure.

- Power up the BCDH

Note: For BCDH Demo 2 board and the BCDH ETU board, the digital outputs of the 5V, 3.3 and 2.5V supplies <u>must</u> be enabled simultaneously.

- Record the BCDH current:

Record BCDH 3.3V current_____ Expected(.017A +/-.005)   _____
Record BCDH 2.5V current_____ Expected(.15A +/-.005)   _____
Record BCDH 5.0V current_____ Expected(.05A +/-.005)   _____

- Power down the BCDH
- Connect the BCDH to the MIC via the interface cable: **Link 14 must be connected to the BCDH ETU board or BCDH Demo 2 board**.
- Connect the loop back cables(J1 and J3) if less than 8 BCDHs are used during this test.
- Power up the Image Processor
- Record Image Processor current:

IP 3.3V Current_____   Expected (.924A +/-.05)   _____
IP 5.0V Current_____   Expected (1.769A +/-.05)   _____

- Power up the BCDH

 Note: For BCDH Demo 2 board   and the BCDH ETU board, the digital outputs of the 5V, 3.3 and 2.5V supplies <u>must</u> be enabled simultaneously.

- Record the BCDH current:

Record BCDH 3.3V current_____ Expected(.017A +/-.005)   _____
Record BCDH 2.5V current_____ Expected(.15A +/-.005)   _____
Record BCDH 5.0V current_____ Expected(.05A +/-.005)   _____

- If 16 links BCDH simulator is used, power and configure the simulator to send the following bit patterns to links to be simulated. Indicate the number of simulated links.:_____

Note: Data must not be sent to any link connected to a Demo 2 or a BCDH ETU.

Link 1: AAAABBBB
Link2: BCDEBCDE
Link3: 5A5A5A5A
Link4: BABEBABE
Link5: FACEFACE
Link 6: DADEDADE
Link 7: ACEDACED
Link8: 1A2B3C4D

Link 9: 0000DDDD
Link 10: CDEF0000
Link 11 5A6A7A8A
Link 12 BBB9AAA9
Link 13 EDCBEDCB
Link 14 ECAFECAF
Link 15 DECADECA
Link 16 9B239B23

5.2 **Configuration: 1 ETU BCDH or Demo 2 Board and 2 MIC Loopback Cables(J1 and J3)**

- Execute script ***Startup.scr*** to configure the Image Processor and to verify the aliveness of the Image Processor MIC, Bulk Memory and the BCDH.   _____

Note: The ***Startup.scr*** script will perform the following functions:

> Configure the MIC PCI
> Configure the BM PCI
> Reset MIC
> Configure Links to be tested
> Set MIC Max Packet length
> Set MIC DMA Configuration
> Set MIC DMA Time Out Configuration

- ## Power dwn the BCDH
- ## Power up the BCDH
- For Link 14, verify the following is received:

> **For BCDH Demo 2 board:**
> 1 BCDH Command Verify
> 1 BCDH CMD Verify Exception   _____
> 4 BCDH DM Command Verify Exceptions   _____
> Verify that the "Cleared Receiver FIFO" bit is set in the BCDH Command Verify Exception Packet.   _____
>
> **For BCDH ETU board:**
> 1 BCDH Command Verify.   _____
> 1 BCDH CMD Verify Exception   _____
> 16 BCDH DM Command Verify Exceptions:(0x   _____

Verify that the "Cleared Receiver FIFO" bit is set in the BCDH Command Verify Exception Packet.   _____

- Execute script ***BatIP.scr*** to send the following data patterns to the following links.   _____

> Link 0: AAAABBBB
> Link1: BCDEBCDE
> Link2: 5A5A5A5A
> Link8: BABEBABE
> Link9: FACEFACE
> Link 10: ACEDACED
> **Note: These data patterns are not sent to Link 14.**

- Read Bulk Memory(Type d0x88000000,100,4)   _____
- Verify the simulated link patterns.   _____

Note : See page 11 for expected bit patterns
Performed by _____*Date*_____

5.3 Command Verification

- Execute script ***test 1.scr***

The script test 1.scr will execute the following commands:
***Command*: BCDH Reset**
***Command*: BCDH Test ADC Mux(1)**
Delay(1sec)
***Command*: BCDH Test ADC Mux(2)**

Continue command-delay sequence through BCDH Test ADC Mux(15) for Demo 2; ADC MUX(7) for ETU.

- Read Bulk Memory Contents (*Type 0x88000000,100,4*)

- For Link 14, verify the following is received:

For BCDH Demo 2 board:
1 Reset Command Verify   _____
1 BCDH Command Verify Exception   _____
4 BCDH DM Command Verify Exceptions   _____
16 Test ADC Command Verifys   _____
Verify that the "Cleared Receiver FIFO" bit is set in the BCDH Command Verify
Exception Packet.   _____
LED illumination at 1 sec intervals in increasing 0000h-1111h

                                                                                    _____

For BCDH ETU board: 1
1 Reset Command Verify.   _____
1 BCDH CMD Verify Exception   _____
16 BCDH DM Command Verify Exceptions: _____
7 Test ADC Command Verifys   _____
Verify that the "Cleared Receiver FIFO" bit is set in the BCDH CMD Verify
Exception Packet.   _____

Note : See page 11 for expected bit patterns

- Print Results

Performed by _____*Date*_____

BCDH Data Packet Definitions

BCDH Data Packet:**: BCDH Command Verify**	Expected Bit Pattern
Comand : BCDH Reset	31-13 Zero 12-8 Zero 7 Zero 6-0 1001011 (0x0000004b)
BCDH Data Packet:**: BCDH DM Command Verify Exception**	Expected Bit Pattern
	31-18 Zero 17 1 16 0 15-11 11111 10-8: Demo 2: 000 or 100 ETU: 000 thru 111 7: 0 or 1 6-0 1101011 (0x0002f86b-) (0x0002fc6b)

	(0x0002fceb)
	(0x0002f8eb)
BCDH Data Packet:: BCDH Command Verify	Expected Bit Pattern
Command : BCDH Test ADC Mux	31-13 Zero
	12-8 10101
	7 Zero
	6-0 1001011
	(0x000154b)

BCDH Data Packet:: BCDH Command Verify Exception	Expected Bit Pattern
	31-19 Zero
	18 1
	17-13 0
	12-8 00000 ETU
	12-8 10101 Demo 2
	7 Zero
	6-0 1001011ETU
	6-0 1101101 Demo2
	(0x000154b) Demo 2
	(0x0004006d) ETU

5.4 Non-Continuos Data Verification

- Execute script *Test2.scr*

The script **test2.scr** will execute the following commands

Command: BCDH Request Status

Command: BCDH Request Version

Command: BCDH Echo Absolute Time Stamp

- Verify the following data packets from Link 14:

A. Status Data Verification

BCDH Status Data Packet   _____

Request Status Command Verify Packet   _____

Note: Record SpaceWire Status bit in table below.   _____

BCDH Data Packet: BCDH Status	Expected Bit Pattern
DW0	31-16 Zero
	15 1
	14-11 Zero
	10 1
	9-7 000
	6-0 1001101b
	(0X0000844D)
DW1	31-11 Zero
	10 1
	9-7 Zero
	6 0 or 1
	5-4 Zero
	3-0 0001

	(0X00000441)

DW2	31-26 Demo2: 0 _____
	          ETU : 1 _____
	25-24 1
	23-18 Demo2: 0 _____
	          ETU : 1 _____
	17-16 1
	15-4 Zero
	3-0 0001
	
	(0X03030001) DEMO 2
	
	(0XFFFF0001) ETU

DW3	31-16 Space Wire Status Register A Bits_____ 15-4 Zero 3-0 0001 (0XE0440001) DEMO 2 (0XE9440001) ETU
DW4	31-16 Space Wire Status Register B Bits_____ 15-9 Zero Demo 2 15-9 00000010 ETU 8 1 7-4 Zero 3-0 0001 (0X50000001 OR 0X1000001) DEMO 2 (0X10000201) ETU

BCDH Data Packet:**: BCDH Command Verify**	Expected Bit Pattern
Command : BCDH Request Status	31-13 Zero 12-8 01000 7 Zero 6-0 1001011 (0X0000084B)

Performed by _____*Date*_____

B. Request Version Verification

BCDH Request Version Packet   _____

Request Version Command Verify Packet   _____

Note: Due to changes in the versions, these bits are not static and are subject to change.

Record the bit pattern in the table below.   _____

Verify data with BCDH lead engineer.   _____

BCDH Data Packet: BCDH Version	Expected Bit Pattern

	31-24 Zero
	23-16 Demo 2: 00001000___
	     ETU: 11100001___
	15-8 Demo 2: 00010000___
	     ETU: 00000101___
	7 Zero
	6-0 1011111
	
	(0X00080C5F) DEMO 2
	
	(0X00E1055F) ETU

BCDH Data Packet:**: BCDH Command Verify**	Expected Bit Pattern
Command : BCDH Request Version	31-13 ZERO _____ 12-8 10011 _____ 7-4 0100 _____ 3-0 1011 _____ (0X0000134B) CHANGES

Performed by _____Date_____

C. BCDH Echo Absolute Time Stamp Verification:
Note: Value of BCDH packet will depend on contents of data in script file.

- Record MET set in Script File: _____
- Record UTC set in Script File: _____
- Record UTC correction (bit 19-4 of DW2)   _____

- Verification:

1. Record contents of the BCDH Absolute Time Stamp Packet in table below.   _____
2. Compare Table contents with Script file contents.   _____
3. Absolute Time Stamp Echo Command Verify   _____

BCDH Data Packet: BCDH Absolute Time Stamp Echo	Expected Bit Pattern
DW0	31-8:MSB of MET_____ 7Zero 6-0 1000011 (0X00000043)
DW1	31-24: LSB of MET_____ 23-4: MSB of UTC _____ 3-0 0001 **(0x0a000001)**
DW2	31-20 LSB of UTC_____ 19-4: 16 bit UTC corr._____ 3-0 0001 **(0x00f00051)**

BCDH Data Packet:**: BCDH Command Verify**	Expected Bit Pattern
Command : BCDH Echo Absolute Time Stamp	31-13 Zero 12-8 00011 7 0 6-0 1001011 (0X0000034B)

- Print Results   _____

Performed by _____*Date*_____

5.5   Continuous Event Count Data Verification

- **Execute script** *test3.scr*

The script *test3.scr* executes the following commands:

BCDH Enable Event Count
Delay(TBD)
BCDH Disable Event Count

- Read data from Bulk Memory Card(Type *0x88000000,100,4)*

- Verify the following data packets from Link 14:   _____

a.   Command Verify: BCDH Enable Event Count   _____
b.   Events Count Packets   _____
c.   Command Verify: BCDH Disable Event Count   _____

- Print data   _____

BCDH Data Packet:**: BCDH Command Verify**	Expected Bit Pattern
Command : BCDH Enable Event Count	31-13 Zero 12-8 00110 7 Zero 6-0 1001011 (0X0000064B)

BCDH Data Packet: **BCDH Block Events Count**	Expected Bit Pattern
DWO	**(0x0000005)**
DW1 occurs every second	**(0x0000001)**

BCDH Data Packet:**: BCDH Command Verify**	Expected Bit Pattern
Command : BCDH Disable Events Count	31-14 Zero 12-8 00111 7 Zero 6-0 1001011 (0X0000074B)

Performed by _____Date_____

5.6 Continuous Time Stamp Data Verification

- Execute script test4.scr

The script *test4.scr* sends the following commands:
BCDH Enable TimeStamp Transmit
Delay(TBD)
BCDH Disable TimeStamp Transmit

- Read Data from Bulk Memory Card (Type *0x88000000,100,4*)

- Verify the following data from Link 14:
a. Command Verify: BCDH Enable TimeStamp Transmit   _____
b. BCDH Time Stamp Packet Contents   _____
c. Command Verify: BCDH Disable TimeStamp Transmit   _____

BCDH Data Packet:**: BCDH Command Verify**	Expected Bit Pattern
Command : BCDH Enable TimeStamp	31-13 Zero 12-8 00100 7 Zero 6-0 1001011 (0X000044B)

BCDH Data Packet: **BCDH TimeStamp**	Expected Bit Pattern
	31-17 Zero 16-7 increasing time(0-99) 6-0 1000111

BCDH Data Packet:**: BCDH Command Verify**	Expected Bit Pattern
Command : BCDH Disable TimeStamp	31-13 Zero 12-8 00101 7 Zero 6-0 1001011 (0X0000054B)

Performed by _____*Date*_____

5.7 Error Injection

a. Invalid Commands

- Run script *test5a.scr*

The script *test5a.scr* sends an invalid command (0x0000003F) to the BCDH with the following
format:

<div align="center">

D1   31-6 Zero
5-0 111101 or 111111

</div>

- Read Bulk Memory, Type *0x88000000,100,4*

- Record bit pattern of command sent(3D or 3F).   _____
- Verify that a BCDH CMD Verify Exception is received .   _____
- Verify that the Invaid CMD bit will be set(bit 16).   _____
- Print Results.   _____

b. Transmission Interruption
- Run script *test5b..scr*

  The script *test5b.scr* sends the command to start the event count on Link 14.

- Disconnect the interface cable between the IP and BCDH.
- Reconnect the cable.
- Verify the occurrence of the error bits in SpaceWire status register Link 14._____
- Verify successful data transmission has resumed.   _____
- Type ***bcdhCmd(0xe,0x4000)***; this stops the event counts.
- Print Results.   _____

c. Parity Error
- Run script test5c.scr

  The script test5c.scr sends the command to start event count on Link 14 then sends a parity error on Link 14.

- Read Bulk Memory, Type 0x88000000,100,4   _____
- Verify error marker (0x0000007c) was captured in data stream   ._____
- Type ***bcdhCmd(0xe,0x4000)***; this stops the event counts.
- Print Results.   _____

Performed by _____*Date*_____

5.8 Interface Characterization

- Insert breakout box between IP and BCDH.
- Execute script signal.scr.
- Using an oscilloscope ,capture and print the waveforms of the following signals:

        a. Data
        b. Data Strobe
        c. 1PPS
        d. 32 MHz Clock
        e. Command
        f. Command Strobe

- Label each waveform and attach to procedure.   _____
- Measure frequency of the 32 MHz clock: _____
- Measure frequency and duty cycle of 1 PPS signal   _____

Performed by _____*Date*_____

Appendix A. BCDH Command and Packet Formats

Table 1 Commands

Category	Command	Cmd Code	Description

		msb - lsb	
Reset	BCDH Reset	0 0 0 0 0	Resets the BCDH and all of the digital circuits on the board.
	BCDH Reset DM	0 0 0 0 1	Resets the DMs specified in the DM Destination Mask.
	BCDH Reset Data FIFO	0 0 0 1 0	Resets the Data FIFO and programs the FIFO's programmable half-full flag
Timestamp	BCDH Echo Absolute Timestamp	0 0 0 1 1	An absolute timestamp is embedded in this command, which is then echoed back in the BCDH data stream.
	BCDH Enable Timestamp Tx	0 0 1 0 0	Enables the autonomous transmission of a 10-msec timestamp packet.
	BCDH Disable Timestamp Tx	0 0 1 0 1	Disables the autonomous transmission of a 10-msec timestamp packet.
Event Count	BCDH Enable Event Count Tx	0 0 1 1 0	Enables the autonomous transmission of an 8-usec event count packet.
	BCDH Disable Event Count Tx	0 0 1 1 1	Disables the autonomous transmission of an 8-usec event count packet.
Status	BCDH Request Status	0 1 0 0 0	Request for a BCDH status packet.
DAC Outputs	BCDH Set Common Bias Voltages	0 1 0 0 1	Sets eight common bias voltages that are distributed to all DMs within the Block.
	BCDH Set High Voltage Control Levels	0 1 0 1 0	Sets eight control levels that are sent to the BVR to control the eight High Voltages.
High Voltage Switch	BCDH Enable High Voltages	0 1 0 1 1	Enables all eight of the High Voltages at once.
	BCDH Disable High Voltages	0 1 1 0 0	Disables all eight of the High Voltages at once.

Category	Command	Cmd Code	Description
		msb - lsb	
House-keeping	BCDH Request Common Bias Voltages	0 1 1 0 1	Request for a housekeeping packet containing the current Common Bias Voltage levels
	BCDH Request High Voltage Control Levels	0 1 1 1 0	Request for a housekeeping packet containing the current High Voltage control levels (digitized High Voltage DAC outputs).
	BCDH Request DM Power Levels	0 1 1 1 1	Request for a housekeeping packet containing the current DM power supply levels
	BCDH Request BCDH Power Levels	1 0 0 0 0	Request for a housekeeping packet containing the current BCDH power supply levels
	BCDH Request Board Temperatures	1 0 0 0 1	Request for a housekeeping packet containing the BCDH, BVR and XA1VR temperatures
	BCDH Request Voltage Ref Levels	1 0 0 1 0	Request for a housekeeping packet containing the current voltage reference levels
	BCDH Request High Voltage Monitor Levels	1 1 0 0 0	Request for a housekeeping packet containing the current High Voltage monitor levels (digitized voltage that is proportional to the actual High Voltage output from the BVR).
Debug (only used in Demo2 and the ETU)	BCDH Request Version	1 0 0 1 1	Request for the current version of the BCDH Verilog firmware.
	BCDH Change Testpoint Mux	1 0 1 0 0	Changes which testpoints internal to the Xilinx FPGA are output to the logic analyzer testports A, B and C
	BCDH Test ADC Multiplexers	1 0 1 0 1	Changes the four multiplexer select pins, which can be verified through the four LEDs
	BCDH Configure DM	1 0 1 1 0	Configures the DM Xilinx FPGA
Loopback	BCDH Loopback	1 0 1 1 1	This command is used to loop simulated DM data out of the DM transmitter back to the DM receiver.

Category	Command	Cmd Code	Description
		msb - lsb	
SpaceWire Configuration	BCDH Change SpaceWire Configuration	1 1 0 0 1	This command is used to change the SpaceWire configuration on the BCDH side. It can be used to change the data transmit rate, as well as reset the SpaceWire link.
Spares	Spare	1 1 0 1 0	Spare command code
	Spare	1 1 0 1 1	Spare command code
	Spare	1 1 1 0 0	Spare command code
	Spare	1 1 1 0 1	Spare command code
	Spare	1 1 1 1 0	Spare command code
	Spare	1 1 1 1 1	Spare command code

Table 2 Generated Data Packets

Data Packet	Data Code	Description
	msb - lsb	
BCDH Block Event Counts	x x x - 0 1 0 1	Four 2-msec counts of all the normal and raw events within the Block.
Data Continuation Marker	x x x - 0 0 0 1	Indicates that this DWord is a continuation of the previously defined Data Type
BCDH Absolute Timestamp Echo	1 0 0 - 0 0 1 1	The BCDH receives an absolute timestamp from the IPE every second. This packet echoes the absolute timestamp back to the IPE so it will be included in the data and will provide a time reference.
BCDH Timestamp	1 0 0 - 0 1 1 1	10-msec timestamp
BCDH Command Verify	1 0 0 - 1 0 1 1	Verification packet that shows that the BCDH received and acted upon the specified command.
BCDH Status	1 0 0 - 1 1 0 1	Status

Data Packet	Data Code	Description
	msb - lsb	
BCDH Common Bias Voltages	1 0 0 - 1 1 1 1	ADC values of the common bias voltages generated by the BCDH
BCDH High Voltage Control Levels	1 0 1 - 0 0 1 1	ADC values of the high voltage control levels generated by the BCDH
BCDH DM Power Levels	1 0 1 - 0 1 1 1	ADC values of the DM power levels
BCDH Power Levels	1 0 1 – 1 0 0 1	ADC values of the BCDH power levels
BCDH Board Temperatures	1 0 1 - 1 0 1 1	ADC values of the BCDH, the BVR, and the XA1VR board temperatures
BCDH Voltage Ref Levels	1 0 1 - 1 1 0 1	ADC values of the voltage references generated by the BCDH
BCDH Version	1 0 1 - 1 1 1 1	Version number of the BCDH (used only in the FPGA version)
BCDH High Voltage Monitor Levels	1 1 0 - 0 0 1 1	ADC values of the voltages that are proportional to the actual high voltages generated by the BVR.
BCDH DM Parity Error	1 1 0 - 0 1 1 1	Error packet generated by the BCDH in response to getting a parity error in a DM packet
BCDH DM Command Verify Exception	1 1 0 - 1 0 1 1	If a DM does not respond to a command by providing a command verify within a specific period of time, or if the command verify is invalid, the BCDH will generate this exception packet
BCDH Spare	1 1 0 - 1 1 0 1	Spare
BCDH Spare	1 1 0 - 1 1 1 1	Spare
BCDH Spare	1 1 1 - 0 0 1 1	Spare
BCDH Spare	1 1 1 - 0 1 1 1	Spare
BCDH Spare	1 1 1 - 1 0 0 1	Spare
BCDH Spare	1 1 1 - 1 0 1 1	Spare